



PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN THE APPLICATION OF:

ROGER MOONS

CASE AD6883USNA
NO.:

APPLICATION NO.: 10/627902

GROUP ART UNIT: 1761

FILED: JULY 25, 2003

EXAMINER: DREW E. BECKER
CONFIRMATION NO.: 3469

FOR: IMPROVED THERMOPLASTIC POLYMERIC OVENWARE

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

DECLARATION UNDER 37 C.F.R. 1.132

1. I obtained a B.S. in Chemistry from the Polytechnic Institute of Brooklyn in 1962 and a Ph.D. in Organic Chemistry from the University of California at Davis in 1967.

2. I am currently receiving a pension from the assignee of this application E.I. DuPont de Nemours & Co., Inc. (hereinafter DuPont).

3. I am a Registered Patent Agent (No. 33,852).

4. I am currently a consultant for DuPont on technical and patent matters.

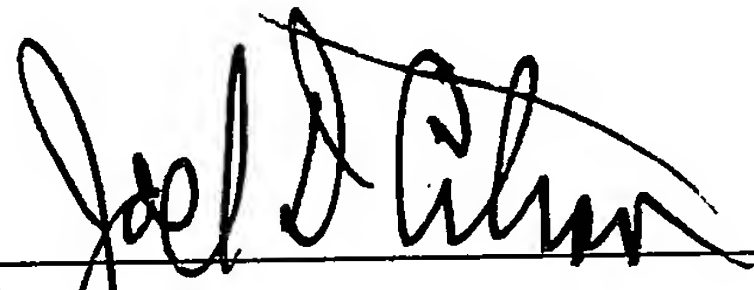
5. While consulting for DuPont I directed an experiment as set forth below.

6. A composition containing 55 weight percent of Zenite® 6000 Liquid Crystalline Polymer (available from E. I. DuPont de Nemours & Co., Inc., Wilmington, DE 19998 USA), 37 weight percent talc, and 8 weight percent carbon fiber was prepared by melt mixing in a 30 mm Werner & Pfleiderer twin screw extruder. The techniques used to prepare this composition were similar to those commonly used to prepare other compositions containing LCPs.

7. The above composition was molded in a 6 oz. HPM injection molding machine into 4 inch diameter disks.

8. An above described disk (after machining) was tested for through plane thermal conductivity. The resulting value was 0.368 W/m²K.

9. The attached pages from Electronic Research Notebooks D100052 and D100008 describe this experiment and the conditions used for the various operations. The sample number for the above described composition was 13-1. The composition of sample 13-2 has been blanked out from the page, and the results for the thermal conductivity of this sample have been omitted.



Joel D. Citron

Date: Mar 2, 2007



DuPont Electronic Laboratory Notebook

Identification Number : D100052-28.01

Experiment Name : D100052-13

Program Name : Zenite

Project Name:Thermoconductivity for Joel Citron

Document Name : D100052-13 series Thermal Conductive Zenite Joel Citron.pdf

Site Name : EXP ST

Business Unit :Engineering Polymers

Author Name : Mike J. Molitor

Date : 02/26/2007 14:59:57

Co-Author Details :

Witness Name : Adcock, Dave

Date : 02/26/2007 15:03:04

Date (GMT)	Signed by
2/26/2007 07:59:57 PM	Name: Mike J. Molitor
	Pre-Sig Hash: 9b9c723fedbb8ec913753be9ae4abc415c4f0fa1
Justification	By entering your password you verify that you planned and/or executed the work, directed the work, analyzed the result, or drew the conclusions described within this document.

2/26/2007 08:03:05 PM	Name: Adcock, Dave
	Pre-Sig Hash: 4004778267dalf14aed9d10dd217ba30817d5b91
Justification	By entering your password you will be signing to say that you have witnessed the information contained in this document

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	Pre-Sig Hash:
Justification	

	Name:
	Pre-Sig Hash:
Justification	

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E.I. du Pont de Nemours and Company

Sample # D100052 13-1 13-2
 Zenite 6000 55
 Jetfil Talc 575C 37
 Carbon fiber Sigrafil 8

100

E. I. du Pont de Nemours and Company

TITLE 30-C DATE 10/1/06 E 110149-77

PURPOSE Comp

J.R.N. 2006-040 DATE 10/1/06 TECHNICIAN CHAMBERLAIN AREA NOTEBOOK
 RESEARCHER M. J. J. J. J. NOTEBOOK/PAGE E-2/10/06-73
 BARREL 20-C SCREW SCREENS
 DIE 1" SIZE 1/2" ADAPTERS PT-5-50/113-FLC/123
 POLYMER 2006-040 CHARGE CODE
 INTERLOCKS CHECKED ✓ RUN STARTED/COMPLETED ✓

AUXILIARY EQUIPMENT USED QUENCH HOT TANK CHANGE TO
5000 R.R. CUTTER L FEEDER 10000
SIZE FEEDER 223/100

SAMPLE #	TIME	SET PTS	ACTUAL	ACTUAL	ACTUAL	ACTUAL	ACTUAL	ACTUAL	ACTUAL
BARREL 2	340	314	322						
BARREL 3	340	309	309						
BARREL 4	340	324	325						
BARREL 5	340	309	324						
BARREL 6	340	327	329						
BARREL 7	340	340	328						
BARREL 8	340	341	329						
BARREL 9	340	340	329						
BARREL 10									
BARREL 11									
BARREL 12									
BARREL 13									
DIE	350	318	328						
ADAPTER									
SCREW SPEED	250	250							
TORQUE	30-40	30-40							
DIE PRESS	28-35	30-38							
VACUUM	30	30							
DCA									
DCV									
FEED 1 PPH	11.0	10.0							
FEED 2 PPH	9.0	6.0							
FEED 3 PPH									
PUMP GPH									
RATE (PPH)	21.6	20.2							
PANEL MELT	359	366							
HAND MELT									
CUTTER SPD									

COMMENTS

EXPERIMENTER Chambers DATE 10/1/06
 WITNESSED BY Stephen R. Rathell DATE 10-31-06

57 m. h. D.F.F.

BOOK PAGE E. I. du Pont de Nemours and Company

TITLE 6 OZ. A INJECTION MOLDING DATE 10-30-06

E 111563-36 PURPOSE PHYSICAL TESTING

JR NO. 1275 NB NO. D 100052 DATE 10-30-06 CYLINDER 6 OZ. A
 FOR ANALYSIS CHARGE/SBU E.P. RAM SPEED FAST
 POLYMER TYPE ZENITE SCREW G.P. SCREW SPEED -
 MOLD 1/2" DIA. (E-7) NOZZLE 1/2" DIA. BACK PRESS 1000

SAMPLE NO.	REAR	CENTER	FRONT	NOZZLE	MOLD TEMP		CYCLE			PRESS. BOOST INJ.	MELT	SWD RM
					A	B	B	I	H			
13-2	325	332	332	323	160	160	2	15	15	350	250	360

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DuPont Electronic Laboratory Notebook

Identification Number : D100008 32.02

Experiment Name : D100008-18

Program Name : Zenite

Project Name: Thermal Conductivity

Document Name : ThermalConductivityofD100052-13-1and13-2.pdf

Site Name : EXP ST

Business Unit : Engineering Polymers

Author Name : Adcock, Dave

Date : 02/26/2007 12:57:03

Co-Author Details :

Witness Name : Harvey, Pat A.

Date : 02/26/2007 13:07:04

Date (GMT)	Signed by
2/26/2007 05:57:03 PM	Name: Adcock, Dave Pre-Sig Hash: Da950462019155610a94b1b42e1360db95513794
Justification	By entering your password you verify that you planned and/or executed the work, directed the work, analyzed the result, or drew the conclusions described within this document.
2/26/2007 06:07:04 PM	Name: Harvey, Pat A. Pre-Sig Hash: 73b0cadeclbdebf8234bdc64d81ae2e301af81ba
Justification	By entering your password you will be signing to say that you have witnessed the information contained in this document
	Name: Pre-Sig Hash:
Justification	
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	Name: Pre-Sig Hash:
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	Name: Pre-Sig Hash:
Justification	

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USING TEST FILE : 13-1.tst
DATE : 11/01/06

TEST DESCRIPTION

3100352-13-1

injection molded disc

SAMPLE ID : 13-1

SAMPLE THICKNESS: 3.030mm

Average sample temperature = 50 C Controller= 30 C

TU (C)	TG (C)	TL (C)	TH (C)	TU-TL (C)	Q	RATIO
50.0	48.2	40.4	30.0	19.64	9472.1	0.211266
60.6	48.0	40.8	29.5	19.75	10096.7	0.195657
60.6	48.1	40.9	29.5	19.73	10107.1	0.195166

Average sample temperature = 75 C Controller= 55 C

TU (C)	TG (C)	TL (C)	TH (C)	TU-TL (C)	Q	RATIO
78.1	65.9	58.4	49.3	19.74	8854.4	0.233231
85.2	72.0	65.6	54.7	19.63	10161.7	0.193207
85.2	72.0	65.6	54.7	19.62	10167.3	0.193013

=====

USING CALIBRATION FILE: ESI04200.cal
USING TEST FILE : 13-1.tst

USING FIRST ORDER FIT

SAMPLE ID : 13-1
SAMPLE THICKNESS : 3.030mm
CTE : 0.000e+000

=====

THE SAMPLE HAS A THERMAL CONDUCTIVITY OF: 3.651347e-001 W/mK
AND A THERMAL RESISTANCE OF : 8.298308e-003 m2K/W
AT A TEMPERATURE OF : 50.76 C

0.365 W/mK

THE DELTA T THROUGH THE SAMPLE IS : 19.73 C
THE HEATER TEMPERATURE IS : 29.54 C
THE DELTA T ACROSS THE STACK IS : 31.10 C
THE GUARD TEMPERATURE IS : 48.10 C

=====

THE SAMPLE HAS A THERMAL CONDUCTIVITY OF: 3.702624e-001 W/mK
AND A THERMAL RESISTANCE OF : 8.183385e-003 m2K/W
AT A TEMPERATURE OF : 75.40 C

0.370 W/mK

THE DELTA T THROUGH THE SAMPLE IS : 19.62 C
THE HEATER TEMPERATURE IS : 54.66 C
THE DELTA T ACROSS THE STACK IS : 30.55 C
THE GUARD TEMPERATURE IS : 72.02 C

=====



DuPont Electronic Laboratory Notebook

Identification Number : D100052-28.01

Experiment Name : D100052-13

Program Name : Zenite

Project Name:Thermoconductivity for Joel Citron

Document Name : D100052-13 series Thermal Conductive Zenite Joel Citron.pdf

Site Name : EXP ST

Business Unit :Engineering Polymers

Author Name : Mike J. Molitor

Date : 02/26/2007 14:59:57

Co-Author Details :

Witness Name : Adcock, Dave

Date : 02/26/2007 15:03:04

Date (GMT)	Signed by
2/26/2007 07:59:57 PM	Name: Mike J. Molitor
	Pre-Sig Hash: 9b9c723fedbb8ec913753be9ae4abc415c4f0fa1
Justification	By entering your password you verify that you planned and/or executed the work, directed the work, analyzed the result, or drew the conclusions described within this document.

2/26/2007 08:03:05 PM	Name: Adcock, Dave
	Pre-Sig Hash: 4004778267dalf14aed9dl0dd217ba30817d5b91
Justification	By entering your password you will be signing to say that you have witnessed the information contained in this document

	Name:
	Pre-Sig Hash:
Justification	

	Name:
	Pre-Sig Hash:
Justification	

	Name:
	Pre-Sig Hash:
Justification	

	Name:
	Pre-Sig Hash:
Justification	

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Sample # D100052 13-1 13-2
 Zenite 6000 55
 Jetfil Talc 575C 37
 Carbon fiber Sigrafil 8

106

E. I. du Pont de Nemours and Company

TITLE 30-C DATE 10/19/66 E 110149-77

PURPOSE Comp

J.R.N. 2006-290 DATE 10/19/66 TECHNICIAN M. J. 10/19/66 RESEARCHER M. J. 10/19/66 NOTEBOOK NO. E-210149-77

BARREL 20-C SCREW 1" SCREENS 40-60-80-100

DIE 1" SIZE 1/2" ADAPTERS PT-4-50/113-FL-133

POLYMER Zenite 6000 CHARGE CODE 100052

INTERLOCKS CHECKED ✓ RUN STARTED 10/19/66 COMPLETED 10/19/66

AUXILIARY EQUIPMENT USED QUENCHER - Change To
3240 AIR CUTTER - FEEDER - 1000
SIZE FEEDER - 250/100

SAMPLE #	TIME	SET PTS	ACTUAL	ACTUAL	ACTUAL	ACTUAL	ACTUAL	ACTUAL	ACTUAL	ACTUAL
BARREL 2	300	310	322							
BARREL 3	340	309	309							
BARREL 4	360	324	335							
BARREL 5	380	369	356							
BARREL 6	340	327	359							
BARREL 7	340	340	338							
BARREL 8	346	341	339							
BARREL 9	340	340	339							
BARREL 10										
BARREL 11										
BARREL 12										
BARREL 13										
DIE	350	318	328							
ADAPTER										
SCREW SPEED		350	350							
TORQUE		27-42	20-41							
DIE PRESS		27-25	20-21							
VACUUM		30	30							
DCA										
DCV										
FEED 1 PPH		11.0	19.0							
FEED 2 PPH		9.0	6.0							
FEED 3 PPH										
PUMP GPH										
RATE (PPH)		21.6	20.2							
PANEL MELT		359	366							
HAND MELT										
CUTTER SPD										

COMMENTS

EXPERIMENTED Stephen R. Rathell DATE 10/19/66

CONTINUED BY Stephen R. Rathell DATE 10-31-66

57 m.h. Diff.

BOOK PAGE E. I. du Pont de Nemours and Company

TITLE 6 OZ. A INJECTION MOLDING DATE 10-30-66

E 111563-36 PLANT CODE PHYSICAL TESTING

JR NO. 1375 NB NO. D 100052 DATE 10-30-66 CYLINDER 6 OZ. A

FOR ANALYSIS CHARGE/STB E. P. RAM SPEED FAST

POLYMER TYPE ZENITE SCREW G. P. SCREW SPEED -

MOLD 8" DISK (E-P) NOZZLE 2 3/8" BACK PRESS 100

SAMPLE NO.	REAR	CENTER	FRONT	NOZZLE	MOLD TEMP		CYCLE				PRESS. BOOST	MELT INJ	MELT	SUCK RAM
					A	B	B	I	H					
13-2	325	352	332	323	100	100	2	15	15	350	250		363	

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DuPont Electronic Laboratory Notebook

Identification Number : D100052-28.01

Experiment Name : D100052-13

Program Name : Zenite

Project Name:Thermoconductivity for Joel Citron

Document Name : D100052-13 series Thermal Conductive Zenite Joel Citron.pdf

Site Name : EXP ST

Business Unit :Engineering Polymers

Author Name : Mike J. Molitor

Date : 02/26/2007 14:59:57

Co-Author Details :

Witness Name : Adcock, Dave

Date : 02/26/2007 15:03:04

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2/26/2007 07:59:57 PM	Name: Mike J. Molitor
	Pre-Sig Hash: 9b9c723fedbb8ec913753be9ae4abc415c4f0fa1
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Justification	

	Name:
	Pre-Sig Hash:
Justification	

	Name:
	Pre-Sig Hash:
Justification	

	Name:
	Pre-Sig Hash:
Justification	

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E.I. du Pont de Nemours and Company

Sample # D100052 13-1 13-2
 Zenite 6000 55
 Jetfil Talc 575C 37
 Carbon fiber Sigrafil 8

666

E. I. du Pont de Nemours and Company

TITLE 30-C DATE 10/19/06 E 110149-77

PURPOSE Comp

J.R.N. 2006-296 DATE 10/19/06 TECHNICIAN AREA NOTEBOOK PG 5
 RESEARCHER M. J. 10/19/06 NOTEBOOK PG E-210149-13
 BARREL 20-C SCREW 20-C SCREENS 20-C
 DIE 1" SIZE 7/16 ADAPTERS 20-C CHARGE CODE 20-C
 POLYMER Zenite 6000 INTERLOCKS CHECKED ✓ RUN STARTED ✓ COMPLETED ✓

AUXILIARY EQUIPMENT USED QUENCH TANK CHARGE TO 500
500 FEEDER 20-C

SAMPLE #	TIME	SET PTS	ACTUAL	ACTUAL	ACTUAL	ACTUAL	ACTUAL	ACTUAL	ACTUAL	ACTUAL
BARREL 2	340	374	322							
BARREL 3	340	309	309							
BARREL 4	340	374	333							
BARREL 5	340	309	334							
BARREL 6	340	327	339							
BARREL 7	340	340	338							
BARREL 8	340	341	339							
BARREL 9	340	340	339							
BARREL 10										
BARREL 11										
BARREL 12										
BARREL 13										
DIE	350	218	328							
ADAPTER										
SCREW SPEED		250	250							
TORQUE		22-42	25-47							
DIE PRESS		21-25	20-27							
VACUUM		30	30							
DCA										
DCV										
FEED 1 PPH		11.0	19.0							
FEED 2 PPH		9.0	6.0							
FEED 3 PPH										
PUMP GPH										
RATE (PPH)		21.6	20.2							
PANEL MELT		359	366							
HAND MELT										
CUTTER SPD										

COMMENTS

EXPERIMENTER Stephen R. Rathell DATE 10/19/06
 SYNTHESIZED BY Stephen R. Rathell DATE 10-31-06

57 m.h. Diff.

BOOK PAGE E. I. du Pont de Nemours and Company

TITLE 6 OR. A INJECTION MOLDING DATE 10-30-06

E 111563-36 PURPOSE PHYSICAL TESTING

JR NO. 1275 NB NO. D 100052 DATE 10-30-06 CYLINDER 6 02 A
 FOR MULTI CHARGE/SBU E. I. RAM SPEED FAST
 POLYMER TYPE ZENITE SCREW G. P. SCREW SPEED -
 MOLD 6" DIAM (E-T) NOZZLE 4 7/32" BACK PRESS MIN.

SAMPLE NO.	REAR	CENTER	FRONT	NOZZLE	MOLD TEMP		CYCLE			PRESS.		MELT	SWD
					A	B	B	I	H	BOOST	INJ		
13-2	325	332	332	323	100	100	2	15	15	350	250		363

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DuPont Electronic Laboratory Notebook

Identification Number : D100008 32.02

Experiment Name : D100008-18

Program Name : Zenite

Project Name: Thermal Conductivity

Document Name : ThermalConductivityofD100052-13-1and13-2.pdf

Site Name : EXP ST

Business Unit : Engineering Polymers

Author Name : Adcock, Dave

Date : 02/26/2007 12:57:03

Co-Author Details :

Witness Name : Harvey, Pat A.

Date : 02/26/2007 13:07:04

Date (GMT)	Signed by
2/26/2007 05:57:03 PM	Name: Adcock, Dave Pre-Sig Hash: 0a9004b2019133010a94b1b42e1300d093613792
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2/26/2007 06:07:04 PM	Name: Harvey, Pat A. Pre-Sig Hash: 73b0cadeclbdebf8234bdc64d81ae2e301af81ba
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Justification	

	Name:
	Pre-Sig Hash:
Justification	

	Name:
	Pre-Sig Hash:
Justification	

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E.I. du Pont de Nemours and Company

USING TEST FILE : 13-1.tst
DATE : 7/10/06

TEST DESCRIPTION

D100052-13-1

Injection molded disc

SAMPLE ID : 13-1

SAMPLE THICKNESS: 3.030mm

Average sample temperature = 50 C Controller= 30 C

TU (C)	TG (C)	TL (C)	TH (C)	TU-TL (C)	Q	RATIO
50.0	48.2	40.4	30.0	19.64	9472.1	0.211266
60.6	48.0	40.8	29.5	19.75	10096.7	0.195657
60.6	48.1	40.9	29.5	19.73	10107.1	0.195166

Average sample temperature = 75 C Controller= 55 C

TU (C)	TG (C)	TL (C)	TH (C)	TU-TL (C)	Q	RATIO
78.1	65.9	58.4	49.3	19.74	8854.4	0.233231
85.2	72.0	65.6	54.7	19.63	10161.7	0.193207
85.2	72.0	65.6	54.7	19.62	10167.3	0.193013

=====

USING CALIBRATION FILE: ESL04200.ca1
USING TEST FILE : 13-1.tst

USING FIRST ORDER FIT

SAMPLE ID : 13-1
SAMPLE THICKNESS : 3.030mm
CTE : 0.000e+000

=====

THE SAMPLE HAS A THERMAL CONDUCTIVITY OF: 3.651347e-001 W/mK
AND A THERMAL RESISTANCE OF : 8.298308e-003 m2K/W
AT A TEMPERATURE OF : 50.78 C

0.365 W/mK

THE DELTA T THROUGH THE SAMPLE IS : 19.73 C
THE HEATER TEMPERATURE IS : 29.54 C
THE DELTA T ACROSS THE STACK IS : 31.10 C
THE GUARD TEMPERATURE IS : 48.10 C

=====

THE SAMPLE HAS A THERMAL CONDUCTIVITY OF: 3.702624e-001 W/mK
AND A THERMAL RESISTANCE OF : 8.183385e-003 m2K/W
AT A TEMPERATURE OF : 75.40 C

0.370 W/mK

THE DELTA T THROUGH THE SAMPLE IS : 19.62 C
THE HEATER TEMPERATURE IS : 54.66 C
THE DELTA T ACROSS THE STACK IS : 30.55 C
THE GUARD TEMPERATURE IS : 72.02 C

=====



DuPont Electronic Laboratory Notebook

Identification Number : D100008 32.02

Experiment Name : D100008-18

Program Name : Zenite

Project Name:Thermal Conductivity

Document Name : ThermalConductivityofD100052-13-1and13-2.pdf

Site Name : EXP ST

Business Unit :Engineering Polymers

Author Name : Adcock, Dave

Date : 02/26/2007 12:57:03

Co-Author Details :

Witness Name : Harvey, Pat A.

Date : 02/26/2007 13:07:04

Date (GMT)	Signed by
2/26/2007 05:57:03 PM	Name: Adcock, Dave Pre-Sig Hash: Da780462D1913361C9461642C136D693813792
Justification	By entering your password you verify that you planned and/or executed the work, directed the work, analyzed the result, or drew the conclusions described within this document.

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Justification	By entering your password you will be signing to say that you have witnessed the information contained in this document

	Name:
	Pre-Sig Hash:
Justification	

	Name:
	Pre-Sig Hash:
Justification	

	Name:
	Pre-Sig Hash:
Justification	

	Name:
	Pre-Sig Hash:
Justification	

Information in this report is proprietary and should be handled according to DuPont Information Security policies

USING TEST FILE : 13-1.tst
DATE : 11/01/06

TEST DESCRIPTION:

3100052-13-1

Injection molded disc

SAMPLE ID : 13-1

SAMPLE THICKNESS: 3.030mm

Average sample temperature = 50 C Controller= 30 C

TU (C)	TG (C)	TL (C)	TH (C)	TU-TL (C)	Q	RATIO
50.0	48.2	40.4	30.0	19.64	9472.1	0.211266
60.6	48.0	40.8	29.5	19.75	10096.7	0.195657
60.6	48.1	40.9	29.5	19.73	10107.1	0.195166

Average sample temperature = 75 C Controller= 55 C

TU (C)	TG (C)	TL (C)	TH (C)	TU-TL (C)	Q	RATIO
78.1	65.9	58.4	49.3	19.74	8854.4	0.233231
85.2	72.0	65.6	54.7	19.63	10161.7	0.193207
85.2	72.0	65.6	54.7	19.62	10167.3	0.193013

USING CALIBRATION FILE: ESL04200.cal
USING TEST FILE : 13-1.tst

USING FIRST ORDER FIT

SAMPLE ID : 13-1
SAMPLE THICKNESS : 3.030mm
CTE : 0.000e+000

THE SAMPLE HAS A THERMAL CONDUCTIVITY OF: $3.651347e-001$ W/mK
AND A THERMAL RESISTANCE OF: $8.298308e-003$ m2K/W
AT A TEMPERATURE OF: 50.76 C

0.365 W/mK

THE DELTA T THROUGH THE SAMPLE IS : 19.73 C
THE HEATER TEMPERATURE IS : 29.54 C
THE DELTA T ACROSS THE STACK IS : 31.10 C
THE GUARD TEMPERATURE IS : 48.10 C

THE SAMPLE HAS A THERMAL CONDUCTIVITY OF: $3.702624e-001$ W/mK
AND A THERMAL RESISTANCE OF: $8.183885e-003$ m2K/W
AT A TEMPERATURE OF: 75.49 C

0.370 W/mK

THE DELTA T THROUGH THE SAMPLE IS : 19.62 C
THE HEATER TEMPERATURE IS : 54.65 C
THE DELTA T ACROSS THE STACK IS : 30.55 C
THE GUARD TEMPERATURE IS : 72.02 C